# Martian atmospheric data analysis: interpreting observations from Mars Global Surveyor, Mars Reconnaissance Orbiter and Mars Trace Gas Orbiter

## Conference or Workshop Item

**Martian atmospheric data analysis: Interpreting observations from Mars Global Surveyor, Mars Reconnaissance Orbiter and Mars Trace Gas Orbiter.**

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Data assimilation, the combination of observations and numerical models which provide physical constraints, and organize and propagate the observational information which is introduced, is commonly used as a means of analysing large atmospheric and oceanic observational data sets for the Earth [1] and notably to form initial states for numerical weather forecasts [2]. Data assimilation also offers significant potential advantages for the analysis of atmospheric data from other planets, which have been demonstrated by the successful assimilation of three martian years (almost six Earth years) of thermal and dust opacity observations from the Thermal Emission Spectrometer aboard Mars Global Surveyor [3]. A similar procedure is now underway with Mars Climate Sounder observations from Mars Reconnaissance Orbiter, now entering its second martian year of operations. We plan to implement the same strategy with the ExoMars Mars Climate Sounder instrument on Mars Trace Gas Orbiter [see the companion talk by Irwin et al.], but to extend the procedure to include three-dimensional dust transport, water cloud aerosol and chemical species, as is now becoming possible with terrestrial data sets [1]. This will enhance our understanding of the dynamics of the martian atmosphere and provide a consistent analysis over six martian years from different instruments using the same numerical model.

[1] Lahoz W. et al. (eds.) (2010) *Data Assimilation: Making Sense of Observations,* Springer, Berlin.
[2} Kalnay E. (2003) *Atmospheric Modeling, Data Assimilation and Predictability,* Cambridge University Press.
[3] Lewis, S. R. et al. [2007] *Icarus,* 192 (2), 327–347.